

REMARKS

Support for the amendments may be found throughout the specification, for example at pages 7-9 and the examples. The amendments entered on pages 7 and 8 of the specification are to provide clear counterparts for the language adopted in claim 1. In this connection it is believed that one skilled in the art reading the disclosure would appreciate that the lactate salt-containing aqueous solution created in step (a) is a raffinate of the original aqueous solution following the contacting step. Claim 37 is based on page 8, line 20. Reference to a water-immiscible amine as the basic extractant is found in claim 7 of the original PCT application and at line 14 of page 3 of the description. Support for claims 40 and 41 is found at page 8, lines 2 and 7 of the description. Claim 45 is supported by original PCT claim 13. Claim 53 is supported by page 11, lines 19 and 20.

The present preliminary amendment considers the prosecution of the application up through the office action mailed April 23, 2002, which constituted a final rejection. A continued prosecution application was filed on April 25, 2003, and an office action issued on June 30, 2003 (paper number 18). As pointed out in applicants' Request to Withdraw Action dated July 9, 2003, the said action of June 30, 2003 was premature because no filing fee had been paid and it was requested that the Office issue a Notice to File Missing Parts (filing fee). Therefore, the office action mailed June 30, 2003 has not been formally considered in the present amendment. However, to expedite matters the objections raised against claims 19 and 34 under 35

USC 112, first paragraph, and against claims 19 and 31 under 35 USC 112, second paragraph, are now dealt with.

In place of "basic extractant" claim 35 and its appropriate dependent claims refer to "water-immiscible basic amine extractant". It is believed that this language meets the requirements of *In re Wands Ex Parte Forman* decisions cited by the Examiner as to allowing a skilled artisan to practice the invention without undue experimentation on the basis of this language.

With respect to the Examiner's objection to the language presumably in claim 22 (not "claim 19" as stated by the Examiner), such a claim is not included in the new set of claims. With respect to the objection to claim 31, corresponding new claim 51 has been worded to make it clear that step (d) includes the use of an acid stronger than lactic acid so as to displace the lactic acid from the lactate salt. One skilled in the art would readily understand what acids stronger than lactic acid would function in this fashion, such as described in the first full paragraph on page 3 of the present description.

Rejections under 35 U.S.C. § 103

During prosecution, the Examiner rejected all claims under 35 USC 103 as being unpatentable over Baniel et al (US 5,510,526) in view of Metz et al (US 4,282,358). In particular, the Examiner stated:

Baniel et al disclose a process for the recovery of lactic acid from a lactate solution composed of sodium lactate...by using a long-chain trialkyl amine... However, the instant invention differs from Baniel et al in that the ratio between free lactate acid and lactate salt is not mentioned.

Metz et al teach a process of manufacturing compounds more than 3 moles of free lactic acid per mole of calcium lactate....

Therefore, if person having an ordinary skill in the art had wished to increase the yield of the lactic acid, it would have been obvious for the skillful artisan in the art to have used Metz et al's ratio between free lactic acid and lactate salt in the fermentation broth in the Baniel et al's process...

Applicants respectfully disagree. Proper analysis under § 103 requires consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition, and (2) whether the prior art would also have revealed that in so making, those of ordinary skill would have had a reasonable expectation of success. *In re Vaeck*, 947 F.2d 488,

20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991). New claim 35, the only independent claim, recites "a process for the recovery of lactic acid from an aqueous solution containing lactic acid and a lactate salt." Furthermore, step a) of the claim requires that lactic acid be extracted from said solution by the water-immiscible basic amine extractant.

Baniel discloses the use of weakly basic trialkyl amines to extract lactate salts from fermentation broths in a pH regime where there is exclusively a lactate salt. Baniel repeatedly notes that lactate solutions are the feed solutions (see, e.g. col. 3, lines 36-40 and lines 47-65; col. 6, lines 10-25; col. 7, lines 38-41, and the claims, all reciting "recovery of lactic acid from a lactate feed solution"). Baniel even notes the distinction between extracting a free acid from a free acid solution as compared to extracting a salt from a salt solution; see, e.g. col. 2, lines 39-67 to col. 3, lines 1-47. As acknowledged by the Examiner, Baniel neither teaches nor suggests using a mixture of free lactic acid and lactate salts, as required in the present claims. Baniel, in fact, openly states (with reference to U.S. Pat. No. 4,275,234) that methods directed to extraction of a free acid with amines (as opposed to extraction of the salt) are "not applicable to a lactate solution of the type commonly obtained from a fermentation process." See col. 3, lines 1-5. If anything, Baniel clearly emphasizes that there are important experimental differences involved in extracting an acid as compared to a salt. Thus, not only does Baniel not suggest treating a mixture of lactic acid and a lactate salt, as required by the present claims, one of skill in the art would have no expectation of success in using Baniel with a mixture of lactic acid and a lactate salt, given Baniel's teachings and given the known buffering effects of salts, as discussed

in the application on pages 4-5.

Metz does not cure the deficiencies of Baniel. Metz describes a process of hyperacidifying pure lactic acid solutions so that one could deliver lactic acid more easily for food purposes. Importantly, the Metz processes start with pure lactic acid; see e.g., Examples 1-7; col. 2, lines 16-20 and lines 34-36. Thus, Metz has a different goal from that of Baniel and the present application, which is to purify lactic acid from e.g., fermentation broths. Applicants therefore respectfully assert that there is no teaching or suggesting in either Metz or Baniel to modify Baniel with Metz to result in the present invention. Because the Metz processes start with pure lactic acid (the goal of the Baniel processes), there would simply be no motivation to mix the Metz compounds with a lactate salt only to repurify the original lactic acid starting material of Metz in the Baniel process.

The Examiner seems to be asserting that the hyperacids of Metz could be used to adjust the ratio of free lactic acid to lactate salt in the Baniel process to result in the mixture of lactic acid and lactic salt of the present claims. There is, however, no suggestion or motivation in Baniel to include lactic acid in his solutions at all; never mind to adjust deliberately the ratio of free lactic acid to lactate salt. As discussed previously, Baniel was directed to purification of lactic acid from lactate solutions. Baniel in no way indicates that a mixture of lactic acid and lactate salt, or an adjustment of the ratio of lactic acid to lactate salt, would yield a more efficient extraction, as the Examiner states. Furthermore, one of skill in the art would have no

reasonable expectation of success in such a modification. It simply would not be clear to one of skill in the art that the hyperacids of Metz would function at equilibrium in an extraction in the same manner as free lactic acid. Even more significantly, the hyperacids of Metz are salt forms, and any addition of the Metz compounds to a Baniel lactate solution would similarly increase the lactate salt concentration. Finally, the proposed application points out on pages 4-5 of the description that mixtures of free lactic acid and lactate salts would be expected to decrease the efficiency of extraction of a free acid, and that the invention was the surprising ability to extract the free acid nonetheless.

Accordingly, the Examiner seems to be using hindsight analysis to combine Metz with Baniel to result in a modification of the free lactic acid to lactate salt ratio.

Regardless of his assessment of the issues discussed above, the Examiner has failed to examine the recitation of the particular steps in claim 19 (corresponding to new claim 35), namely those further steps which are not disclosed in or suggested by Baniel. Namely in step (d) one extracts the aqueous raffinate solution separated in step (b) with stripped extractant formed in step (c) to form a lactate acid-containing stripped extractant and uses (e) said lactic acid-containing stripped extractant formed in step (d) as the basic amine extractant in step (a). None of the references cited by the Examiner discloses a process for the recovery of lactic acid and an aqueous solution containing free lactic acid and a lactic salt by extraction with a basic lactic acid-containing amine extractant, where in practice the stripped extractant from step

(c) is used as the extractant for the lactic acid-depleted aqueous raffinate solution separated in step (b) and then (after acquiring some lactic acid) for the extraction of the lactic acid of a fresh solution of lactic acid and lactate salt. There is no suggestion in the references that free lactic acid in the presence of a lactate salt could be extracted using a partially loaded extractant as in the present process. This sequence of operations obviates the need to operate two separate extraction cycles and takes advantage of the fact that the stripped extractant, which has the strongest extraction power is utilized where the strong extraction power, is mostly needed, that is in step (d). The general advantages of this aspect of the invention are described on page 9 of the description.

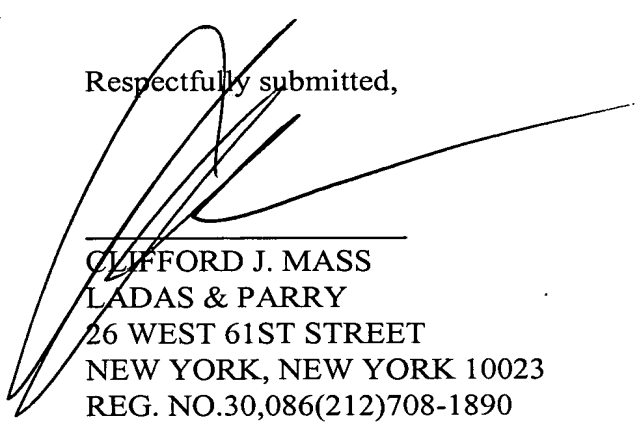
It is pointed out that in the system in Baniel the regenerated extractant is directly recycled by recycle stream (24) shown by dashed lines in the diagram of Baniel through the conversion extraction zone (18). See column 8, lines 58-62 of Baniel. In the instant invention the stripped extractant leaving extract regeneration unit 22 in Baniel would be sent to a further extraction zone for treatment of the aqueous phase withdrawn along path 20 (rather than being sent back to the fermentation zone). In the present invention the lactic acid-containing extractant resulting from the further extraction step utilized in the present invention would then be sent to the conversion extraction zone 8 of Baniel. This mode of recycling with a further extraction step is in no way taught by Baniel or the other references of record.

The previous limitations in claim 19 as to the minimum percentage of recovery in step (a) and the minimum total concentration of the lactic acid and lactate salt have been removed as not necessary to define the broadest aspect of the invention, and these features are now contained in new claims 38 and 42, respectively.

In view of the above explanations and amendments, it is believed that the Examiner will now appreciate the allowable subject matter now claimed in the application and will proceed to process the application for acceptance.

If there are matter in which the undersigned can be of assistance in expediting the allowance of the application, the Examiner is asked to contact the undersigned by the indicated telephone number below.

Respectfully submitted,



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